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ABSTRACT

According to the cognitive-congruency principle, humor appreciation peaks when the cognitive demands of the stimulus are congruent with the cognitive level of the child. This study tested the principle with jokes based on concepts associated with concrete operational thinking, conservation of mass and weight. This method provides a satisfactory basis for operationally defining amount of challenge to cognitive structures, a means of developing humor stimuli that sample a single measurable concept, and a means of determining whether emotionally salient content is necessary to demonstrate the operation of the cognitive-congruency principle. Ss were 96 white females at four age levels: 16 nonconservers and 16 conservers of mass in grade 1, 16 nonconservers and 16 conservers of weight in grade 2, 16 sixth graders, and 16 first-year graduate students. Ss rated each joke on a five-point funniness scale and were observed for spontaneous smiling and laughing. Support for the cognitive-congruency principle was obtained for funniness ratings but not for smile-laugh ratings. For conservation of mass jokes, a peak in funniness was reached among second graders who were nonconservers of weight but conservers of mass. For conservation of weight jokes, the peak occurred among first-grade conservers of mass. [Filmed form best available copy.] (KM)

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Children's Appreciation of Humor:

A test of the Cognitive-congruency Principle

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This paper was presented in a symposium on "Stimulus and cognitive determinants of children's humor" (Michael Lewis, chairperson) at the meeting of the Society for Research in Child Development, Philadelphia, March, 1973.

### Children's Appreciation of Humor: A test of cognitive-congruency principle

While Piaget's (1951) early observations of infants' pleasure in mastery received little attention from psychologists in this country for many years, the sharp increase in infancy research in the past decade has led to a renewed interest in the operation of cognitive processes as a source of pleasure and reinforcement. Data from several studies (e.g., Kagan, 1967, 1971; Shultz and Zigler, 1970; Zelazo and Komer, 1971; and others) strongly suggest that stimulus events which are moderately novel or discrepant from previously established schemas are most likely to be accompanied by increased smiling. This smile presumably reflects the pleasure derived from assimilating the event to a schema through some accommodation (Piaget, 1951). The stimulus event is not immediately assimilable since it lies outside the range of variation of events previously assimilated into that schema. However, persistent efforts to change the schema - if successful - lead to cognitive change and a sense of pleasure in achieving this new level of cognitive mastery. According to Kagan (1967, 1971), the key factor in determining the amount of pleasure derived from successful assimilation is the amount of effort expended leading up to the assimilation. Thus, repetitions of the same event, or very slight discrepancies from an already established schema are not experienced as very pleasurable upon assimilation because they require no effort. Extremely large discrepancies also fail to generate pleasure in this sense, since they are too unfamiliar or discrepant to be assimilated to any of the infants' schemas. In general, then, there is strong support for the view that infants do experience more pleasure in successfully assimilating or

understanding events which present some optimal moderate amount of challenge to them than events which are either impossible to understand or present no challenge at all.

Zigler, Levine, and Gould (1966) have suggested that a similar process occurs in humor. They advanced a "cognitive-congruency principle", which argued that "... cartoons which make few cognitive demands elicit a lower mirth response than those that are in keeping with the complexity of the child's cognitive apparatus." To test this principle, Zigler, et al. (1967) obtained groups of cartoons which were matched in terms of difficulty level for each of 3 grades (3, 5, 7). That is, on the basis of performance of another group of Ss on a larger sample of cartoons, E selected four groups (representing four difficulty levels) of cartoons for each grade level, such that a given group of cartoons for one grade was equally difficult (as judged by comprehension scores) for Ss in that grade as the corresponding group for Ss in another grade. Using overt expression of affect and cartoon preference scores as measures of appreciation, their data showed a peak in humor appreciation for the moderately difficult cartoons in all three grades. Zigler, et al. concluded that these findings support the cognitive-congruency principle, since "The magnitude of the mirth response was found to depend upon the degree of cognitive congruence existing between the cognitive demand features of the humor stimulus and the cognitive resources of the individual." As pointed out by McGhee (1971), however, Zigler did not attempt to specify either (a) systematic differences in the cognitive resources possessed by Ss obtaining different comprehension scores, or (b) how the cognitive demand features varied among the different difficulty levels of the stimuli used.

McGhee (1971) tried to overcome these two deficiencies by using a Piagetian theoretical framework. He used two categories of stimuli hypothesized to differ in the degree to which concrete operational thought capacities were a prerequisite for comprehension of the humor depicted. While concrete operational thinking was not necessary for comprehension of cartoons and jokes based on some form of visual or physical discrepancy from Ss prior experience, it was found to play an important role in the comprehension of humor based on more abstract expectancy violations in which the physical organization of the depicted elements remained intact and consistent with S's experience. However, this relationship was only obtained for comprehension. The expected finding for rated funniness did not occur. If the cognitive-congruency principle holds, then children who have acquired concrete operational thinking should find the latter more abstract humor funnier than the simpler violation of visual expectancies. Similarly, among children who have begun to acquire concrete operational capacities, either a positive linear or inverted U relationship should occur between degree of acquisition of concrete operational thinking and perceived funniness of the more abstract and complex humor stimuli. Since neither of these approaches demonstrated any kind of significant relationship between cognitive level and humor appreciation, McGhee concluded that no support was obtained for the cognitive-congruency principle.

Apart from my concern about the way Zigler et al. tested this principle, my feeling upon completion of this study was that one reason for my failure to support Zigler et al.'s findings might lie in the differential nature of the humor stimuli used by Zigler and myself. While their cartoons sampled a wide range of psychological content areas (e.g., hostility and

dependency relationships), I made every effort to remove such bases for humor, relying instead on the straight violation of acquired expectancies either for relationships between different aspects of the environment or for some aspect of behavior. My assumption at that point was that if the cognitive-congruency principle does describe a genuine phenomenon in humor, it should be most clearly manifest in humor based primarily upon the violation of established cognitive expectancies or schemas. That is, if it is in fact the "stretching" of S's cognitive abilities (as in the infant attention studies) which is the critical factor, then the operation of this principle should be clearest for humor based primarily upon their functioning. The fact that support was not obtained for the principle in my 1971 study suggests that the emotionally-salient content of the Zigler et al. cartoons may have accounted for their findings. That is, "getting the point" of a joke or cartoon at the edge of one's cognitive abilities may give rise to a greater mirth response than one easily comprehended when the humor content is emotionally salient to the recipient.

The present study provides an additional test of the cognitive-congruency principle, eliminating two of the weaknesses of the McGhee (1971) study. While McGhee did improve upon Zigler et al.'s (1967) approach by actually measuring children's cognitive capacities and selecting humor stimuli designed to tax those abilities, concrete operational thinking is clearly composed of a complex of several different (although highly related) abilities. In contrast to the experimental model provided by research on infant attention, McGhee's (1971) humor stimuli did not sample particular known schemas or concepts which are acquired with the onset of operational thinking. A satisfactory test of the cognitive-congruency principle requires that humor stimuli be selected in which

comprehension of the point of the intended humor depends upon the utilization of particular measurable schemas or concepts. Furthermore, there must be some basis for predicting in advance how much effort will be required for successful assimilation of the stimulus content into those schemas. I have tried to resolve this problem in the present study by developing jokes based on specific conceptual acquisitions associated with concrete operational thinking; namely, conservation of mass and conservation of weight (e.g., 1) "Ms. Twilly went to the bakery and asked for a loaf of white bread cut into thick slices. The baker nastily answered, "You'll get it sliced thin like everybody else. Who do you think you are trying to get more bread for your money?" 2) "Two scoops of chocolate, please" Joey asked the icecream man. "Do you want that in 1 dish or 2, sonny?" "Only one. It's too close to supper for 2 dishes of ice cream." said Joey.

A preoperational child should not be able to understand this joke since it taps thought capacities which he has not yet developed. Once a child has acquired conservation of mass, however, he should be able to understand the joke and, in line with the cognitive-congruency principle, it should be maximally funny at some point soon after the concept is acquired since it would be most taxing on the newly developed conservation concept at that time. While it is difficult to predict in advance when this peak might occur, the months or years following it should witness a gradual decrease in funniness as the amount of challenge posed to efforts directed toward comprehension drops. Thus, this approach provides both a satisfactory basis for operationally defining amount of challenge to cognitive structures, and a means of developing humor stimuli which sample a

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single measurable concept exclusively.

Jokes of this type also offer a means of determining whether emotionally-salient content is necessary to demonstrate the operation of the cognitive-congruency principle in humor. By developing relatively "pure" examples of jokes based on such concepts as conservation, and comparing them to comparable jokes anchored in an aggressive context, the role of the "tendentious" nature of the stimulus content in the operation of the cognitive-congruency principle may be determined.

#### METHOD

##### Subjects

The Ss were 96 girls at four different age levels: a) 16 nonconservers and 16 conservers of mass in grade 1; b) 16 nonconservers and 16 conservers of weight in grade 2; c) 16 sixth graders; and d) 16 first year graduate students (between ages 21-23). All Ss were white, and were obtained from a suburban middle class school district.

##### Apparatus

The materials used consisted of Play-doh for the conservation tasks, 18 jokes, and a funniness rating scale.

##### Conservation tasks

Two differently colored sets of Play-doh were used for each conservation task. Thus, each S used four different containers of Play-doh for the two tasks.

##### Humor materials

Of the 18 jokes used, six were based on violations of conservation of mass and six on violations of conservation of weight. Half of each



type contained aggressive while the remaining half contained non-aggressive (and non-tendentious in general) conservation violations. One example of each joke type is presented in Table 1.

### Procedure

Subjects were tested individually in their own school in a separate experimental room. Two female research assistants served as E's, with Ss in a given condition being randomly assigned to one of the Es. All Ss received the two conservation tasks first, followed by 12 jokes whose order of presentation was randomized independently for each S.

### Conservation tasks

The conservation of mass and weight tasks were administered according to the standardized procedures set forth by Elkind (1961). Following Elkind's procedure, prediction, judgment and explanation responses were obtained for each S. In order to differentiate between true conservation and "pseudoconservation" (Piaget, 1967), a check was administered in addition to the above procedure. Following Piaget's test for pseudoconservation with respect to liquid, Ss were given a small portion of Play-doh which had been made into a small pancake by E. The E also gave S a larger mass of Play-doh and asked S to take as much from it as he needed to make a ball having the same amount (or weight) of Play-doh as the pancake. An S was classed as a conserver only if all answers on the prediction, judgment, explanation, and check portions of the task were satisfactory.

Subjects in the grade 1 nonconservers of mass group consisted of children who failed to give satisfactory judgment, explanation, and check responses. Grade 1 conservers of mass included Ss who conserved mass

but failed the conservations of weight task. Grade 2 nonconservers consisted of Ss who were classed as conservers of mass but nonconservers of weight, while grade 2 conservers included Ss classed as conservers of both mass and weight. In the remaining two groups only those Ss with satisfactory responses on all parts of both tasks were retained for the balance of the experiment.

#### Humor materials

Subjects were randomly assigned to either the aggressive or non-aggressive condition, and were presented a randomly ordered set of 12 jokes. While Ss in aggressive and non-aggressive conditions received three aggressive and three non-aggressive versions of conservation of mass and weight jokes respectively, all Ss received the three examples of novelty and incongruity jokes taken from the McGhee (1971) study. While primarily serving as "filler" jokes, since these jokes have been previously related to operational thinking they were also considered to have some theoretical relevance in the present study.

Before reading the first joke to S, E said: "Now I'm going to read you some stories. While girls your age find some of these to be funny, there are others that they don't find funny at all. So, after I read the story I'd like you to tell me if you think its funny, O.K?" For each joke E asked: "Do you think that story is funny?" If S answered "yes", E presented S with a five-point funniness scale (ranging from "not funny at all" to "very funny") and asked S to indicate how funny she thought the story was. The E then asked S why she thought the story was funny ("What is there about it that makes it funny?") and how she might change the story so that it wouldn't be funny.

In addition to using S's funniness ratings as a measure of appreciation of the depicted humor, the two E's also rated the amount of spontaneous smiling and laughing shown following the punch line of the story. The E's showed 367 video tapes in rating smile-laugh responses according to a three-point scale ranging from no reaction at all, through a partial or full smile, to a clearly detectable laugh.

### RESULTS

Two-way ANOVAS (Cognitive level VS straight-aggressive version of joke) were computed on funniness ratings and smile-laugh ratings for each type of joke. The main effects for cognitive level are shown in the first slide. This slide shows that support for the cognitive-congruency principle was obtained for funniness ratings given by Ss, but not for smile-laugh ratings. (See Figure 1) For conservation of mass jokes a peak in funniness was reached among second graders who were nonconservers of weight but conservers of mass ( $p < .07$ ). For conservation of weight jokes, this peak clearly occurs among first grade conservers of mass ( $p < .02$ ). There were no cognitive level main effects for smile-laugh ratings. There were also no significant main effects for joke version. Thus, straight and aggressive versions of these conservation jokes were perceived as being equally humorous. One significant interaction effect was obtained for smile-laugh ratings for conservation of mass jokes. As shown in the next slide (see Figure 2), while aggressive conservation of mass jokes were maximally funny among nonconserving (weight) second graders, this group showed the lowest appreciation of the straight version of the jokes. Among college students the opposite trend was found.

## DISCUSSION

The data obtained for funniness ratings clearly provide support for the cognitive-congruency principle. The inverted U relationships found for funniness as a function of length of acquisition of conservation provide the clearest evidence yet obtained for the view that the amount of cognitive demand made upon a child by a joke plays an important role in determining its funniness. This demand appears to reach a peak within the first year after the acquisition of conservation occurs. The fact that the lowest funniness ratings for both conservation of mass and weight jokes were given by college graduate students suggests that these jokes provided minimal challenge for comprehension to these students and consequently were simply not very funny.

The fact that the presence or absence of aggression in conservation jokes did not significantly influence the shape of the inverted U relationships obtained suggests that McGhee's (1971) failure to replicate Zigler et al.'s (1967) support for the cognitive-congruency principle was not due to the tendentious nature of Zigler et al.'s stimuli, in contrast to McGhee's nontendentious stimuli. Rather, McGhee's attempt to relate degree of operational thinking to funniness ratings within a single age level (age 7) probably accounts for his failure to support the cognitive-congruency principle. It was possible to test this notion in the present study since the filler jokes used were the same stimuli used in McGhee's (1971) more abstract "incongruity" humor. Using the present approach to testing the cognitive-congruency principle for these jokes, support for the principle is clearly obtained. An inverted U relationship ( $p < .02$ ) for funniness ratings was obtained with the peak occurring among first

grade conservers of mass. Thus, McGhee's more abstract expectancy-violation jokes were funniest soon after the child had begun to acquire operational thinking.

The fact that the peak level of appreciation of conservation of weight jokes occurred among first grade conservers of mass (who had not yet acquired conservation of weight) deserves some explanation. One would expect this peak to occur among second grade conservers but since they have only recently acquired the capacity for conservation of weight. We found, both in this study and in a pilot study, that although mass-conserving first graders did show differential performance on the original tests used for determining conservation of mass and weight, they did not seem to discriminate between mass jokes and weight jokes. Thus, while weight was the dimension violated in these jokes, first and second graders may have interpreted them as being violations of conservation of mass.

The clearest way to determine this, of course, is to simply examine these S's explanations of why the cartoons were funny. Unfortunately this is not possible since most first and second graders were not able to verbalize the violation of conservation for either mass or weight jokes. This is a problem I have consistently run into with this type of joke, in contrast to other types of cartoons and jokes I've used in other studies. There were enough Ss in each age group who did give explanations indicative of comprehension of the violation, however, to do a separate analysis among Ss who understood the jokes. As shown in the next slide (see Figure 3), the same trend was found among those who clearly understood that conservation was violated that was found for subjects in general. (All Ss were

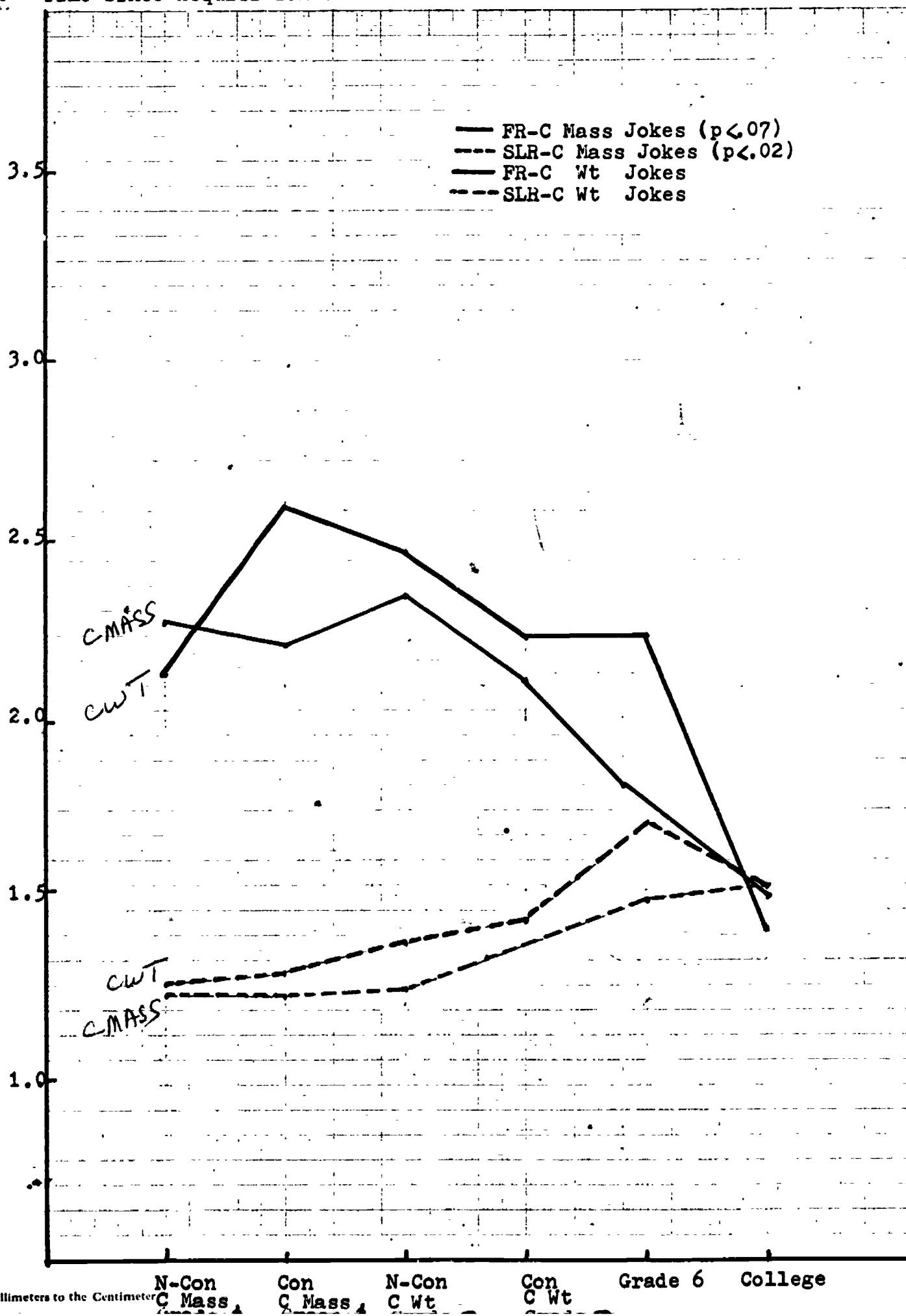
included in the nonconserving first grade group since none of them showed comprehension of the joke). In fact the peak among first grade conservers is even greater than for Ss in general.

It seems clear from these data, then, that the amount of cognitive challenge posed by a joke does indeed contribute to the perceived funniness of that joke. However, I have just completed a replication already with conservation of mass and class inclusion jokes, which again failed to demonstrate the expected inverted U relationship. Thus, these findings must still be considered tentative.

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Figure 1: Humor Appreciation as a Function of Length of Time Since Acquisition of Conservation





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Figure 2: Smile-Laugh Ratings for Conservation of Mass Jokes as a Function of Cognitive Level and Joke Version ( $p < .007$ )

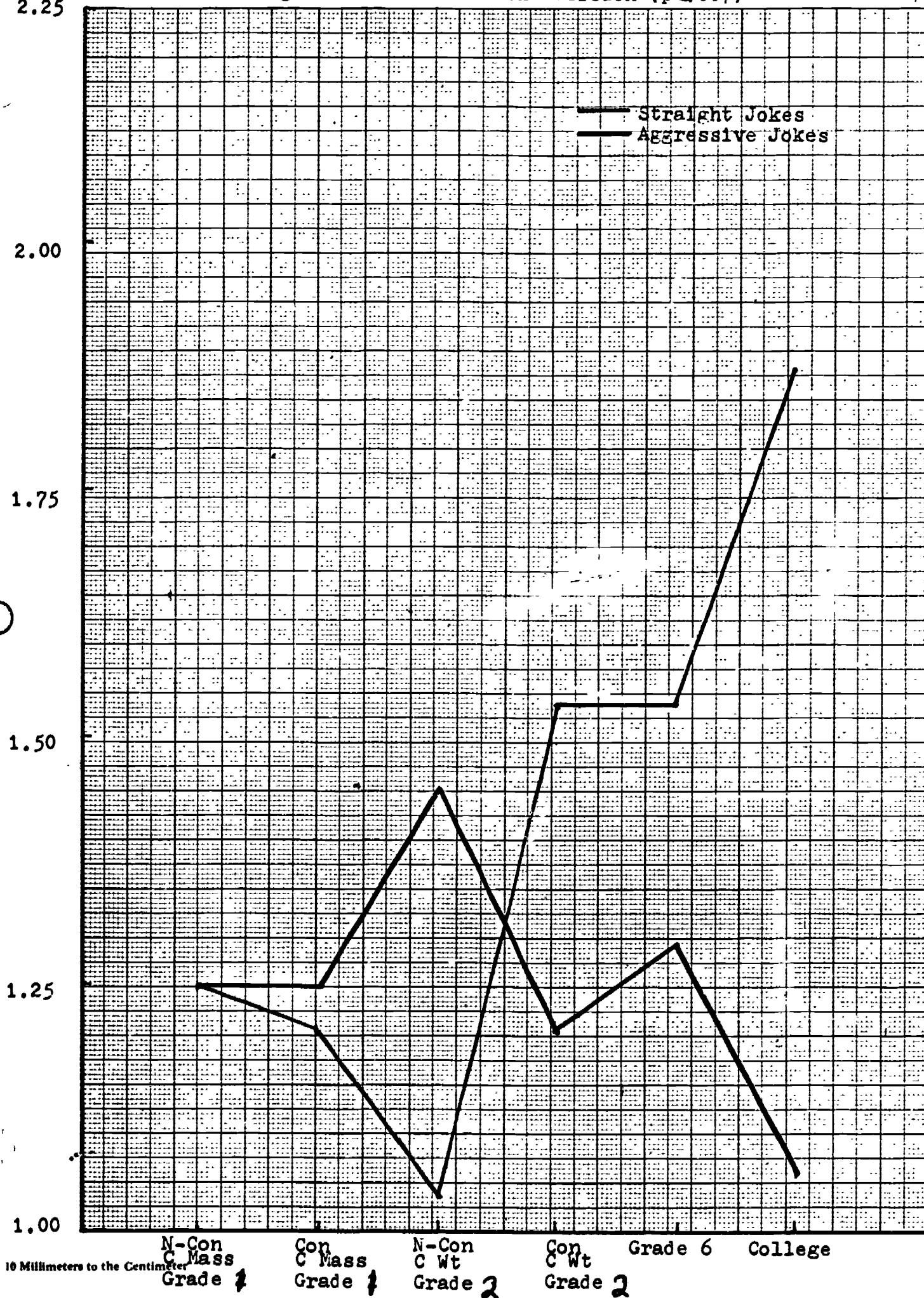
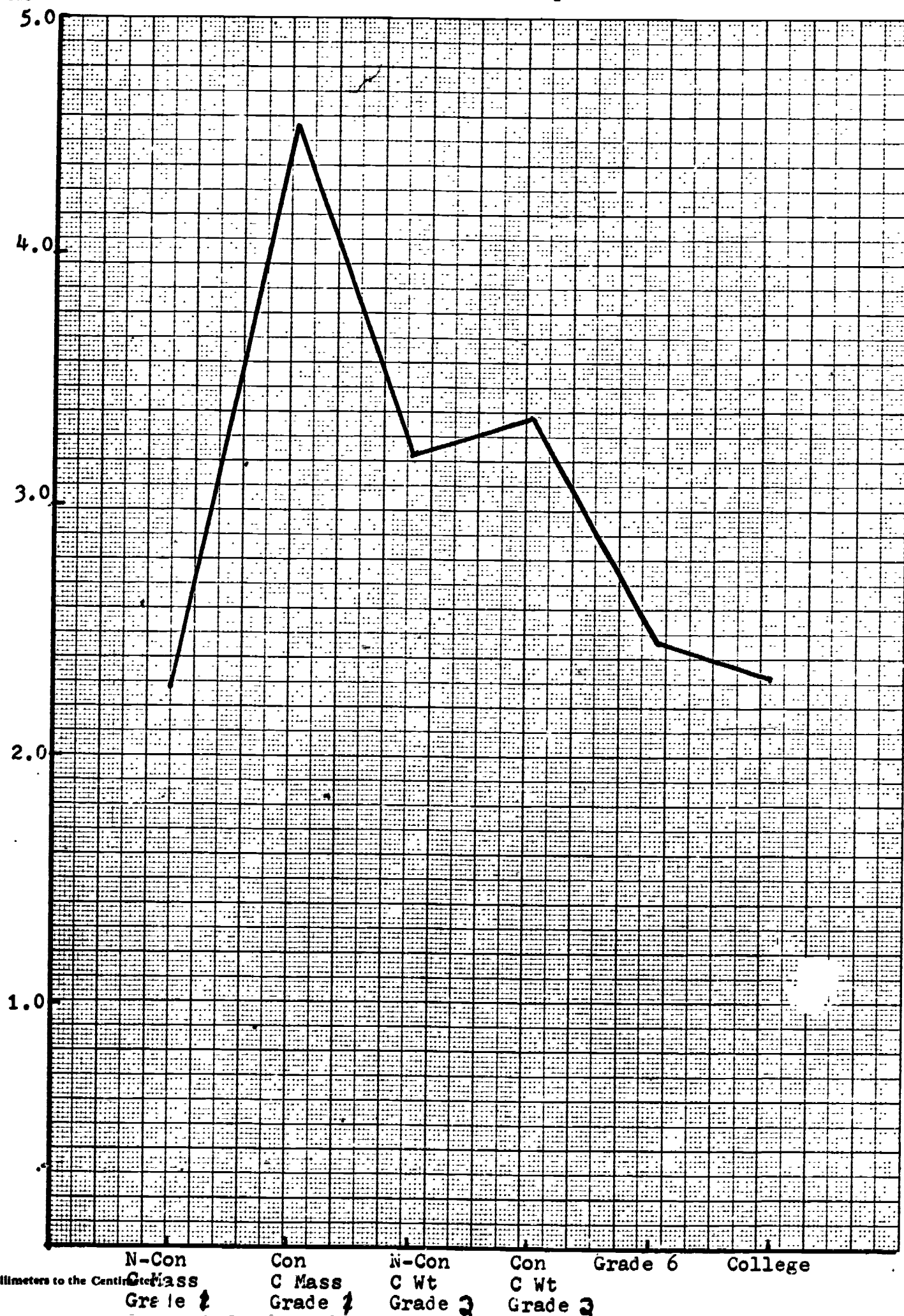


Figure 3: Funniness Ratings For Conservation of Weight Jokes as a Function of Length of Time Since Acquisition of Conservation



Conservation jokes used in McGhee. Children's appreciation of humor: A test of the cognitive-congruency principle (Submitted to Developmental Psychology, and presented at SRCD, 1973)

1) Conservation of mass jokes - straight version.

- A. Mr. Jones went into a restaurant and ordered a whole pizza for his dinner. When the waiter asked if he wanted it cut into 6 or 8 pieces, Mr. Jones said: "Oh, you'd better make it 6! I could never eat 8 pieces."
- B. Joey lives near an ice cream store where they use a really big scoop for serving ice cream. One day Joey asked for two scoops, and the ice cream man asked him if he wanted the two scoops in one dish or two. "Oh, just one dish", said Joey, "I could never eat two dishes of ice cream."
- C. Johnny's mother walked into a restaurant and ordered a whole fruit cake to eat. When the waitress asked if she wanted it cut into four or eight pieces, she said: "Just cut it into four pieces, I'm trying to lose some weight."

2) Conservation of mass jokes - aggressive version.

- A. Mr Jones went into a restaurant and asked for a whole pizza for his dinner. Because he didn't have a tie on, the waiter was very nasty to him. This made Mr. Jones so mad that when the waiter asked if he wanted the pizza cut into 6 or 8 pieces, he answered: "Oh, you'd better make it 6! Your pizza probably tastes so bad that I could never eat 8 pieces."
- B. Joey and some other boys lived near an ice cream store where they use a really big scoop for serving ice cream. The other boys were very mean and didn't like Joey. One day they all went in for ice cream and Joey asked for two scoops. When the ice cream man asked the other boys if they wanted their two scoops in one dish or two, Joey said: "Oh, just put them in one dish; they're such sissies, they could never eat two dishes of ice cream."
- C. Johnny's mother is very fat, and likes to eat whenever she can. Mrs. Smith across the street didn't like Johnny's mother, and never got along with her at all. One day they were both eating in a restaurant, and Johnny's mother ordered a whole fruit cake to eat. When the waitress asked if she would like the cake cut into four or eight pieces, Mrs. Smith said: "Just cut it into four pieces, she's so fat she needs to lose some weight."

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3) Conservation of weight jokes - straight version.

- A. Billy is only five years old, and when his family moved to another city, he was unable to help carry things to the truck because he was too small. Finally his father did ask him to carry a 10 pound bag of potatoes. When his father found Billy in the kitchen jumping up and down on the potatoes, Billy said: "I'm not strong enough to carry 10 pounds of regular potatoes, but I can carry 10 pounds of mashed potatoes."
- B. George and Howard had a raft that they made out of old logs. One day they took a picnic lunch out on the raft and were going to have a nice lunch out in the middle of the lake. When they started eating their lunch, George took his thermos of lemonade and drank it all at once. Just then the raft started to sink. George said: "That'll teach me to drink my lemonade all at once. I've made the raft so heavy we're about to sink."
- C. Mary is six years old and went to the bakery one day to get five one pound loaves of bread for her mother's party. When she saw that the bread was cut into very thick slices, she said: "Oh, you'd better slice them thin! I could never carry them home sliced that thick."

4) Conservation of weight jokes - aggressive version.

- t A. Billy is only five years old, and when his family moved to another city, he wanted to help carry things to the truck. But whenever he tried to help, his father would get very nasty and tell him to stay out of the way because he was too small. This made Billy very mad, so when his father finally did ask him to carry a 10 pound bag of potatoes, Billy started jumping up and down on the potatoes. When his father asked what he was doing, Billy said: "I'm not strong enough to carry 10 pounds of regular potatoes, but I can carry 10 pounds of mashed potatoes."
- B. George and Howard had a raft that they made out of old logs. One day they took a picnic lunch out on the raft and got into an argument over who had the best fishing pole. George was very mean and laughed at Howard's cheap pole because it didn't look as nice as his new expensive one. George also stole Howard's thermos of lemonade when he wasn't looking and drank it all up. Just then the raft started to sink, and Howard said: "That'll teach you to drink all my lemonade.. You've made the raft so heavy we're about to sink."
- C. Mary is six years old and went to the bakery one day to get five one pound loaves of bread for her mother's party. On her way in, she accidentally knocked over a tray of doughnuts onto the dirty floor. This made the baker so mad that he yelled at Mary and told her that she was a stupid little girl. But when Mary saw that the bread was cut into thick slices, she said: "You're the one who's stupid! Any idiot can see that cutting them thick will make them so heavy that I could never carry them home."